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- (21) Application No. 47896/73 (22) Filed 12 Oct. 1973 (19)  
 (23) Complete Specification filed 25 Sept. 1974  
 (44) Complete Specification published 16 July 1975  
 (51) INT. CL.<sup>3</sup> G06M 3/06  
 (52) Index at acceptance  
 G4D 6C1 6C2 6L 6Y 7X



## (54) SYSTEM FOR PROCESSING MEDICAL PRESCRIPTIONS

(71) I, JOHN FRYER PREECE, a British subject of 378 Pinhoe Road, Exeter, Devon, EX4 8EG, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to a system for processing medical prescriptions.

In order to provide a background for the present invention, the basic stages and operations involved in the current system for processing medical prescription forms will first be reviewed.

The prescription form originates, of course, with the doctor who completes the form to indicate the medicament prescribed for his patient. At this stage, the completed form contains four essential pieces of information, namely the patient's identity, the prescribing doctor's identity, the item or items prescribed and the quantity of each item to be dispensed.

The patient then takes the prescription form to the retail pharmacist of his choice, who dispenses the prescribed items in accordance with the doctor's written instructions. However, the pharmacist's involvement with the prescription form does not end with the dispensing of the prescribed items, for he then has to replenish the dispensed items on his shelf by recourse to the wholesaler and obtain payment of the prescription costs by recourse to the pricing bureau in the case of a prescription made on the National Health Service.

In the sequence of events which follows the actual dispensing operation, a surprising amount of labour is expended in manual processing of the prescription form. Thus, to obtain payment, the pharmacist has to add to the prescription form his branch stamp, the number of items on the form and the pack size from which he has dispensed. The pack size dictates the price which the pharmacist receives from the pricing bureau, and the pharmacist has a duty to stock the correct pack size to conform with a six week turnover in the item concerned in the case

of branded items. Furthermore, the pharmacist is required to submit his prescription forms to the pricing bureau classified according to the type of prescriber, whether or not the patient is exempt from payment, the Area Health Authority, the doctor's name and the month. In a small shop the resulting form sorting may occupy about ten hours per month.

As far as restocking is concerned, the retail pharmacist must keep records of the items dispensed so that he may place suitable orders with his wholesaler. Moreover, retail pharmacists reorder stock much more frequently than is usual for most retail trades, and the local wholesaler is faced with meeting myriad demands, preparing the necessary bills and replenishing his own wholesale stock.

The prescription forms are sent from the retail pharmacist each month to the pricing bureau where the items and quantities shown on the forms are priced item by item, totalled and all other necessary deductions and additions incorporated. The resulting figures are passed back to the Area Health Authority who reimburse the retail pharmacist. The Chemist Contractors Central National Health Service Committee maintains surveillance of the pricing process by instigating checks on test batches of forms. Finally statistics are extracted which reflect prescribing habits for individual doctors, and national and regional patterns.

It is true that considerable changes have taken place in the dispensing of prescriptions over the past thirty years, the main features being the diminution in the number of private prescriptions and a steady reduction of that proportion of medicaments which have to be prepared by the retail pharmacist on the premises. Thus, as regards the latter feature, it is noteworthy that the vast majority of preparations are now delivered by the manufacturer in a pre-packaged form or in dispensing packs from which the retailer only has to count out the required quantity.

Whilst the changes in presentation and in packaging undoubtedly save the pharmacist

a considerable amount of time and effort, he must still replenish his stocks with regard to turnover, delivery delay and shelf life. Furthermore, he is still responsible for the clerical work involved in preparing the prescription forms for forwarding to the pricing bureau.

It is an object of the present invention to provide a system for processing medical prescriptions in a manner which enables the amount of manual clerical work involved to be reduced.

Accordingly, in a first aspect, the present invention provides a method of processing medical prescriptions, including: providing a recordable signal indicating the contents of a pack from which an item on the prescription is to be dispensed; using a counting machine to count out the prescribed quantity of the item; providing a recordable signal indicating the dispensed quantity of the item; and recording the signal indicating the contents of the pack and the signal indicating the dispensed quantity of the item on a data support to provide a machine-readable record of the dispensed item.

Preferably, the signal indicating the contents of the pack is a recordable output signal of a reading machine used to read a machine readable indication of the contents provided on the pack.

One method embodying the invention includes using a counting machine providing a recordable output signal indicating the dispensed quantity of the item, and directly recording the output signals of the reading and counting machines on the data support.

Another method embodying the invention includes generating the recordable signal indicating the dispensed quantity of the item in control means which is preset to the quantity of the item to be dispensed and controls the operation of the counter.

Preferably, the reading machine is also used to read a machine-readable indication of the prescribing doctor which is provided on the prescription form, and the corresponding output signal from the machine is recorded on the data support in association with the record of the items prescribed on that form.

Desirably, the method of the invention further includes the steps of applying a machine-readable label bearing a serial number to the prescription form, reading the label using the reading machine and recording the corresponding output signal of the machine on the data support in association with the record of the items prescribed on that form.

According to a second aspect of the invention, there is provided apparatus for processing medical prescription forms, including: means for providing a recordable signal indicating the contents of a pack from which an item on the prescription is to be dis-

dispensed; a counting machine for counting out the prescribed quantity of the item; a recording machine having a data support; and control means connected to the reading and counting machines, such control means being operable to deliver to the recording machine the signal indicating the contents of the pack and a recordable signal indicating the dispensed quantity of the item for recording on the data support as a machine-readable record of the dispensed item.

Preferably, the means for providing a signal indicating the contents of the pack comprise a reading machine for reading a machine-readable indication provided on the pack.

In one apparatus embodying the invention, the counting machine provides a recordable output signal indicating the dispensed quantity of the item, and the control means is operable to deliver the output signals of the reading and counting machines to the recording machine for recording on the data support.

In this case, the counting machine includes a channel down which tablets or capsules to be dispensed are fed by gravity, such channel being provided with photo-electric sensing means for registering the tablets as they pass and providing an electrical output signal significant of the number of tablets delivered.

In another apparatus embodying the invention, the recordable signal indicating the dispensed quantity of the item is provided by the control means which is preset to the quantity of the item to be dispensed and controls the operation of the counter.

In this case, the counting machine includes a channel down which tablets or capsules to be dispensed are fed by gravity, a photo-electric sensing means for registering the tablets as they pass down the channel, and means for preventing further tablets being dispensed when the quantity registered by the photo-electric sensing means is equal to the quantity preset in the control means.

Preferably, the reading machine also serves to read a machine-readable indication of the prescribing doctor which is provided on the prescription form, and the control means is operable to record the corresponding output signal from the machine on the data support in association with the record of the items prescribed on that form.

Desirably, the reading machine further serves to read a machine-readable label bearing a serial number which is attached to the prescription form by the user of the apparatus, and the control means is operable to record the corresponding output signal of the machine on the data support in association with the record of the items prescribed on that form.

Suitably, the machine-readable information is provided in the form of a bar code

and the reading machine includes an optical scanner adapted to scan the bar coded information and to produce a corresponding electrical output signal.

5 In order that the invention may be readily understood, embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

10 Figure 1 is a schematic block diagram of one apparatus embodying the invention; and

Figure 2 is a block diagram of another apparatus embodying the invention.

15 In an exemplary system embodying the present invention, the retail pharmacist is provided with packs of preparations each of which is provided with a machine-readable indication of the contents of the pack, i.e. the nature of the medicament, its strength and the pack size. The indication is provided by a bar code printed on the outside of the pack, the code comprising a succession of short parallel lines of two different thick-  
20 nesses to represent the information in binary form. A third width of line is used to subdivide the coded indication into groups.

25 Each prescription form is also provided with a printed bar code giving a machine-readable indication of the details of the prescribing doctor. Further, the retail pharmacist is provided with a supply of bar-coded labels each representing a serial number to be assigned to a prescription form which he dispenses.

35 Apparatus for processing the prescription forms is provided in the retailer's shop, one embodiment of such apparatus being illustrated in Figure 1 and including a high speed solid state counting machine shown schematically at 1 and adapted to count tablets and capsules. The counting machine 1 includes a plurality of channels each provided with a photo-electric sensor. A throat of the machine communicates with the channels, and tablets poured into the throat at 2 divide  
45 between the various channels, fall past the sensors and out at 3 onto a tray ready for packaging. The total number of tablets which has been counted is indicated by an output electrical signal  $S_N$ . If desired, a visual indication of the total can also be provided as a check for the user. Provision is made for resetting the counter after each count.

55 Also included in the apparatus is a reading machine 4 which is adapted to read the bar coded information provided on the packs of preparations and on the prescription form presented to the reading machine at 5. The machine 4 reads the bar-coded information by sweeping a light beam across the series of lines of the code and detecting the interrup-  
60 tions in reflection caused by each line.

An electrical signal  $S_B$  corresponding to the result of this scanning operation is delivered at an output of the machine 5.

The outputs  $S_N$  and  $S_B$  of the counting and reading machines 1 and 5 are connected through a control arrangement 6 to the input of a cassette type magnetic tape recorder 7. The control arrangement includes an item  
70 key 8 and a final key 9 to control the recording of the signals  $S_N$  and  $S_B$  from the counting and reading machines 1 and 5 on the tape recorder, further keys 10 also being provided to enable additional information and instruc-  
75 tions to be lodged on the tape.

The use of the described apparatus by a retail pharmacist in dispensing a prescription presented to him is as follows:

80 On receipt of the prescription, the retailer first allocates a serial number to the prescription form by attaching a bar coded label to it. He then selects the items on the prescription one by one according to each entry on the form. In dispensing each item, the re-  
85 tailer uses the tablet counter 1 to count the required number of tablets and records the electrical signal  $S_N$  representing this number on the tape by pressing the item key 8 of the control arrangement 6. As he presses the  
90 item key 8, he also presents the bar coded indication on the pack he is using for reading by the reading machine 4, so that the quantity dispensed and the details of the pack are recorded together side by side on  
95 the tape. When he has dispensed all the items on the prescription, the retailer presses the final key 9 whilst presenting the bar codes on the prescription form to the reading machine, so that the serial number and the prescribing  
100 doctor's details are recorded on the tape.

The information which the pharmacist has recorded is thus:

A. *The prescribing doctor's bar code.* This translates into the doctor's name, address and prescribing status. 105

B. *The serial number*, which is given by the pharmacist to the prescription form. This is important for matching paper prescription forms with tape records during later  
110 cross checks. The serial number may also incorporate information to show differences in exemption status of the patient with regard to payment of prescription charges, and the identity of the Area Health Authority. 115

The same serial number in numerical form may conveniently be issued to the patient on a strip of paper at the time that the retailer first receives the prescription from the patient. At the same time a duplicate of this  
120 strip should be retained by the counter assistant and inscribed clearly with the patient's name and address to be attached later as a label to the outside of the container in which the drugs are parcelled ready for col-  
125 lection by the patient.

C. *The quantity* registered by the tablet counter for each item. If an original pack is used instead of the counter then this is registered as a single item. 130

D. *The items*: their nature, strength and pack size.

E. *The chemist's identity*. The cassette contains unique information and is labelled with the chemists name, address and date.

The information thus stored on tape is suitable for processing as one of a batch by a computer with consequent savings in processing costs.

The system described above provides economies in clerical effort, as will be appreciated from the following considerations:

1. The pharmacist no longer has to add his branch stamp, pack size and number of items to the prescription form. He therefore makes no clerical contribution to the form unless, acting on behalf of the doctor, he has to alter an item.

2. The pharmacist no longer has to sort, sub-sort, order and tally the prescription forms when they are returned for pricing since the details by which various categories of prescription differ have been registered on the tape alongside the items and quantities, and are sorted by the computer. The categorising details are patient's exemption status and Area Health Authority (serial number bar code), and doctor's identity and prescribing status (doctor's bar code).

3. With a frequency which is determined by the needs of stock replenishment, the cassettes are submitted to the local wholesaler. The wholesaler uses a machine which reads the tapes, amasses totals of items and units and after reference to the retailers known reserve, turnover, optimal pack size and the shelf life of the stock in question, lists the quantity and pack of the fresh supply to be allocated for delivery to the retailer.

4. The wholesaler's data machine also invoices the items listed for delivery to the retailer, and keeps the accounts relating to them.

5. The wholesalers own stock control is maintained by an extension of the same system. Here the calculations will take into account not simply a set pattern of stock by which supplies from manufacturers are re-ordered, but in addition the turnover, trends in turnover, delivery time and shelf life of the stock items.

6. After processing by the wholesaler, the cassettes are forwarded with the bundle of prescription forms to the pricing bureau. Here all pricing is done by computer directly from the information recorded on the tape.

Although it need only be simple and rapidly accomplished, a manual check procedure is necessary at this point in order to prevent fraud. The quantity and two check letters from the name of the item taken from the prescription form, if typed on a keyboard could be matched automatically against the cassette data. Further developments may well

prove that this type of check procedure can be automated in future.

7. The double check on test batches of prescription forms by the Chemist Contractors Central National Health Service Committee is rendered unnecessary.

8. Statistical analysis of prescribing habits and drug use would be automated and rapidly available.

9. Speedier and more accurate and detailed information can provide a basis for more effective control of the use and cost of drugs. Doctors could be provided with a valuable guideline in the form of a breakdown of their prescribing costs by categories such as antibiotics, analgesics, antirheumatics as compared with the national and regional figures. The Government would have much more accurate and up to date information on the basis of which to negotiate with manufacturers.

Since replenishment of retail pharmaceutical supplies would be matched against the number of items specified on prescription, a measure of control would be introduced at the retail level.

(It would become more difficult, for instance, to sell hypnotics over the counter as the supplies needed would have to be obtained through a channel of an emergency requisition.)

Figure 2 illustrates another apparatus embodying the invention including a counting machine 11 adapted to count out the required number of tablets from a larger supply in accordance with the setting of a control 18 such as a keyboard on a control arrangement 16. A visual indication of the setting of control 18 is provided by an illuminated display 19.

The counting machine 11 comprises an input tray for receiving a supply of capsules or tablets to be dispensed from a stock pack. The supply of tablets is introduced into the counting machine 11 at 12 and, in use, the input tray is mechanically agitated so that tablets on the tray fall in succession through an aperture in the base of the tray into a channel provided with a photo-electric sensor for counting the tablets. After counting the tablets leave the counting machine 11 by a dispensing chute and are discharged into a dispensing container at 13.

The number of tablets to be dispensed is preset by control 18 on the control arrangement which feeds the counting machine with a signal  $S_N$  indicating the quantity of tablets to be dispensed. When the quantity registered by the photo-electric sensor of the counting machine 11 equals the preset quantity, a shutter in the machine is moved to direct excess tablets into another chute from which they are discharged at 13<sup>1</sup> back into the stock pack.

As in the case of Figure 1, the apparatus

also includes a reading machine 14 which is adapted to read the bar coded information provided on the packs of preparations and on the prescription form presented to the reading machine at 15. The electrical output signal of the reading machine is delivered to the control arrangement 16 which includes further keys 20 to enable additional information and instructions to be entered on the tape.

The use of the apparatus illustrated in Figure 2 is similar to that of the Figure 1 apparatus, except that the signal  $S_N$  indicating the dispensed quantity of tablets is provided by the control 18 of the control arrangement 16, such signal being used to control the counting machine 11 and also being fed to a tape recorder 17. Further, no item and final keys are provided on the control arrangement 16, the signals  $S_N$  and  $S_B$  being automatically entered on the tape as a result of the setting of control 18 and the presentation of the bar code to the reading machine 14. After such recording the tape is automatically moved to the next space. The doctor's identity bar code is recorded consistently either before or after the prescription data, so that no further key is required to separate the data of consecutive prescriptions on the tape.

The apparatus of Figure 2 has the advantage that the counting machine operates automatically to count out the tablets and thus enables the pharmacist to write the label for the dispensing container whilst the tablets are being counted. With the counting machine of the Figure 1 apparatus, the pharmacist has to continue tipping in tablets slowly until the desired number is achieved.

Clearly various modifications can be made in the above described embodiments of the invention. For example, the machine-readable indications provided on the packs of preparations may be in the form of a bar code comprising lines of different colours rather than different widths and a reading machine suitable for reading such a bar code may be used. Also a counter having a mechanical sensing arrangement may be used instead of a counter having a photo-electric sensing arrangement.

Further, the serial code could, instead of being applied to the prescription form by the retailer, be preprinted on the prescription form. In this case, the serial number would also include coded information specifying the doctor's identity and prescribing status and the identity of the Area Health Authority. The prescription charge exemption status of the patient could then be recorded as a simple YES/NO alternative in bar-coded form or as a keyboard signal entered by the control arrangement.

In another variant, the serial number could be dispensed with entirely and the

doctor's identity and prescribing status and the identity of the Area Health Authority alone could be preprinted on the prescription form, the prescription charge exemption status of the patient again being recorded as a simple YES/NO alternative as before. In this case, because of the absence of serial numbers, checks at pricing bureau level would be made on a unit consisting of all information on a given tape cassette.

#### WHAT I CLAIM IS:—

1. A method of processing medical prescriptions, including: providing a recordable signal indicating the contents of a pack from which an item on the prescription is to be dispensed; using a counting machine to count out the prescribed quantity of the item; providing a recordable signal indicating the dispensed quantity of the item; and recording the signal indicating the contents of the pack and the signal indicating the dispensed quantity of the item on a data support to provide a machine-readable record of the dispensed item.

2. A method according to claim 1, wherein the signal indicating the contents of the pack is a recordable output signal of a reading machine used to read a machine readable indication of the contents provided on the pack.

3. A method according to claim 2, including using a counting machine providing a recordable output signal indicating the dispensed quantity of the item, and directly recording the output signals of the reading and counting machines on the data support.

4. A method according to claim 2, generating the recordable signal indicating the dispensed quantity of the item in control means which is preset to the quantity of the item to be dispensed and controls the operation of the counter.

5. A method according to any one of claims 2 to 4, wherein the reading machine is used to read a machine-readable indication of the prescribing doctor which is provided on the prescription form, and the corresponding output signal from the machine is recorded on the data support in association with the record of the items prescribed on that form.

6. A method according to any one of claims 2 to 5, which further includes the steps of applying a machine-readable label bearing a serial number to the prescription form, reading the label using the reading machine and recording the corresponding output signal of the machine on the data support in association with the record of the items prescribed on that form.

7. Apparatus for processing medical prescription forms, including: means for providing a recordable signal indicating the contents of a pack from which an item on the

prescription is to be dispensed; a counting machine for counting out the prescribed quantity of the item; a recording machine having a data support; and control means connected to the reading and counting machines, such control means being operable to deliver to the recording machine the signal indicating the contents of the pack and a recordable signal indicating the dispensed quantity of the item for recording on the data support as a machine-readable record of the dispensed item.

8. Apparatus according to claim 7, wherein the means for providing a signal indicating the contents of the pack comprise a reading machine for reading a machine-readable indication provided on the pack.

9. Apparatus according to claim 8, wherein the counting machine provides a recordable output signal indicating the dispensed quantity of the item, and the control means is operable to deliver the output signals of the reading and counting machines to the recording machine for recording on the data support.

10. Apparatus according to claim 9, wherein the counting machine includes a channel down which tablets or capsules to be dispensed are fed by gravity, such channel being provided with photo-electric sensing means for registering the tablets as they pass and providing an electrical output signal significant of the number of tablets delivered.

11. Apparatus according to claim 8, wherein the recordable signal indicating the dispensed quantity of the item is provided by the control means which is preset to the quantity of the item to be dispensed and controls the operation of the counter.

12. Apparatus according to claim 11, wherein the counting machine includes a channel down which tablets or capsules to be dispensed are fed by gravity, a photo-electric sensing means for registering the tablets as they pass down the channel, and means for preventing further tablets being dispensed when the quantity registered by

the photo-electric sensing means is equal to the quantity preset in the control means.

13. Apparatus according to any one of claims 8 to 12, wherein the reading machine also serves to read a machine-readable indication of the prescribing doctor which is provided on the prescription form, and the control means is operable to record the corresponding output signal from the machine on the data support in association with the record of the items prescribed on that form.

14. Apparatus according to any one of claims 8 to 13, wherein the reading machine further serves to read a machine-readable label bearing a serial number which is attached to the prescription form by the user of the apparatus, and the control means is operable to record the corresponding output signal of the machine on the data support in association with the record of the items prescribed on that form.

15. Apparatus according to any one of claims 8 to 14, wherein the machine-readable information is provided in the form of a bar code, and the reading machine includes an optical scanner adapted to scan the bar coded information and to produce a corresponding electrical output signal.

16. A method of processing medical prescriptions substantially as hereinbefore described with reference to Figure 1 or Figure 2 of the accompanying drawings.

17. Apparatus for processing medical prescriptions substantially as hereinbefore described with reference to, and as illustrated in, Figure 1 or 2 of the accompanying drawings.

FORRESTER, KETLEY & CO.,

Chartered Patent Agents,

Forrester House, 52 Bounds Green Road,  
London N11 2EY.

and

Rutland House, Edmund Street,  
Birmingham B3 2LD.  
Agents for the Applicant.

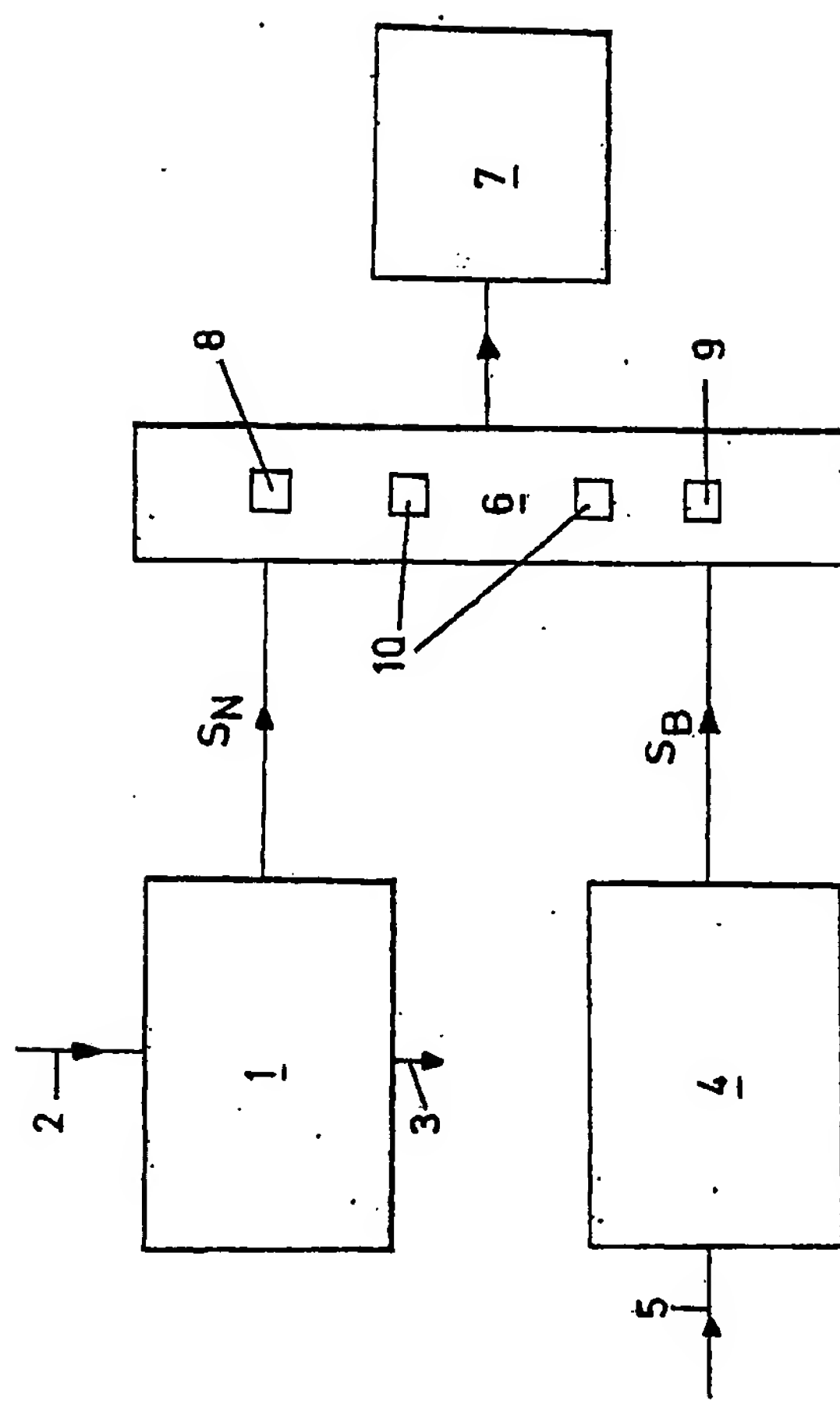


FIG.1

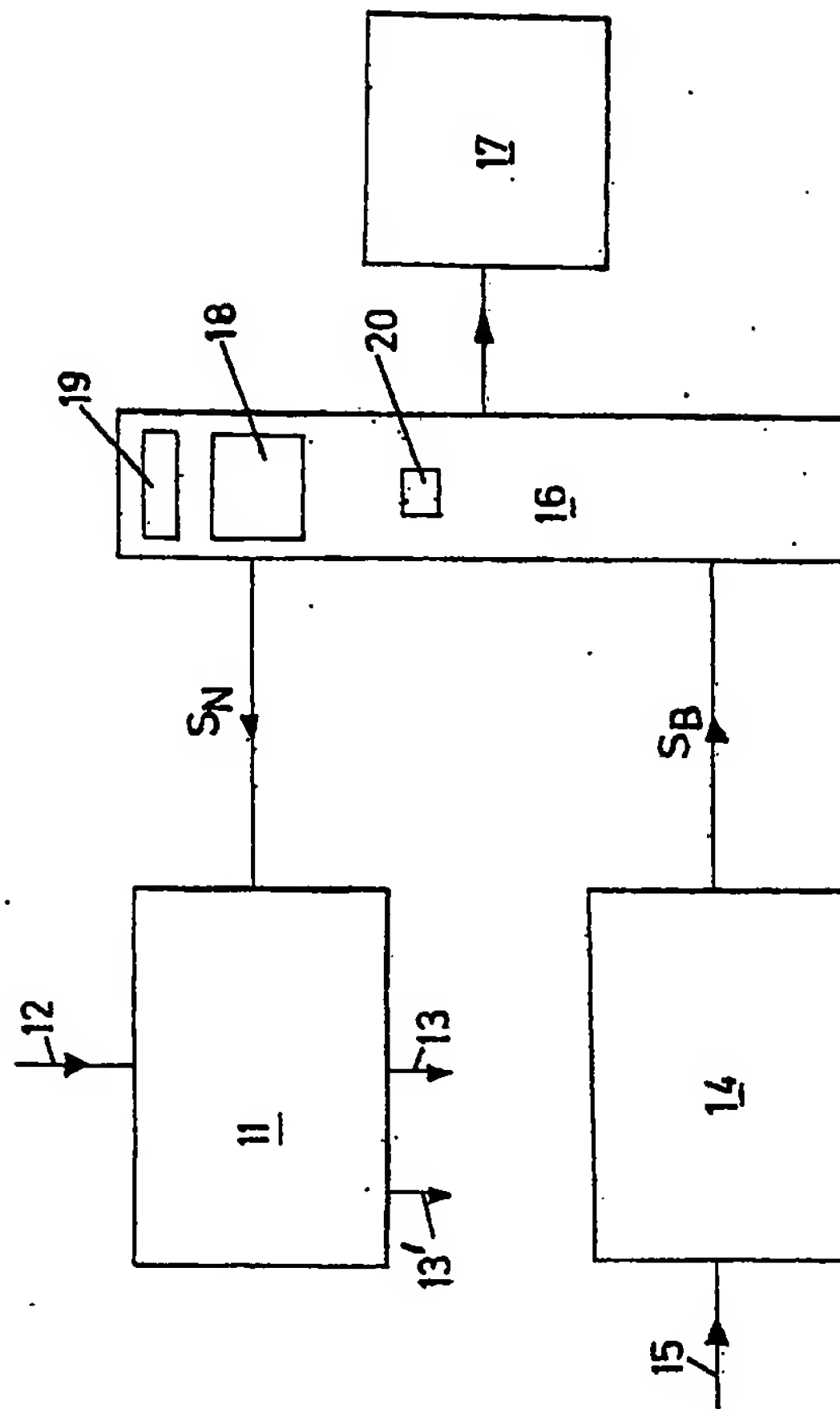


FIG. 2